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OVERHEAD PROJECTOR/PRINTER

[Obaheddo Purojekkuta Purinta]

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/1[1]

Specification

1. Title of the invention

Overhead Projector/Printer

2. Claim

An overhead projector/printer, characterized by the fact that in an overhead projector/printer equipped with an illumination means, a projection means, and a photographing means having a one-dimensional line sensor consisting of a photographing lens and a photoelectric converting element which can be slid to a light incident through it, a means that enables an emission line-shaped irradiation is installed in the above-mentioned illumination means; the above-mentioned means that enables an emission line-shaped irradiation and the above-mentioned one-dimensional line sensor are connected; and the above-mentioned one-dimensional line sensor is projected on a screen irradiated in an emission line shape via the projection means from the above-mentioned illumination means.

[1] Numbers in the margin indicate pagination in the foreign text.

3. Detailed explanation of the invention

(Industrial application field)

The present invention pertains to an overhead projector (hereinafter, it is called an overhead projector/printer) having a function of photographing and printing an original image on a screen.

(Prior art)

Conventional overhead projectors being used in conferences and explanatory meetings, as well known, a light-transmitting film into which characters and figures are written is placed on a condenser mirror and irradiated with a light, so that the light reflected by a light source mirror is projected on a screen via a projection lens.

(Problems to be solved by the invention)

However, in these conventional overhead projectors, since there was only the projecting function, their usage was very limited.

Therefore, the purpose of the present invention is to solve the above-mentioned problems and to provide a new overhead projector (overhead projector/printer) having a function of projecting and printing an original image on a screen as well as a projecting function. In particular, the purpose of the present invention is to provide a small-scale portable overhead

projector that effectively carried out an illumination on the screen during photographing by using an ordinary overhead projector. /2

(Means to solve the problems)

In order to solve the above-mentioned problems, the technical means of the present invention is characterized by the fact that in an overhead projector/printer equipped with an illumination means, a projection means, and a photographing means having a one-dimensional line sensor consisting of a photographing lens and a photoelectric converting element which can be slid to a light incident through it, a means that enables an emission line-shaped irradiation is installed in the above-mentioned illumination means; the above-mentioned means that enables an emission line-shaped irradiation and the above-mentioned one-dimensional line sensor are connected; and the above-mentioned one-dimensional line sensor is projected on a screen irradiated in an emission line shape via the projection means from the above-mentioned illumination means.

(Operation)

The above-mentioned technical means is operated as follows. Since the means that enables an emission line-shaped irradiation and the one-dimensional line sensor are connected and the one-dimensional line sensor is projected on the screen irradiated in

an emission line shape via the projection means from the illumination means, the illumination during photographing can be effectively carried out.

(Application example)

Next, the present invention is explained in detail referring to the figures based on an application example.

Figure 1 is a side view showing an application example of the overhead projector/printer of the present invention and perspectively shows the main constitutional elements of an optical system. In the figure, 10 is a photographing system and consists of a photographing lens 11 and a line sensor 12 movable in the direction perpendicular to the figure. The line sensor 12 is constituted by a one-dimensional solid image sensor (for example, CCD) in which a number of pixels are arranged in a column. Figure 2 is a detailed diagram of the photographing system 10. In the figure, (A) is a side view showing the internal structure, and (B) is a rear view. Both ends of a carrier 14 for supporting the line sensor 12, as shown in the figure, is installed so that it can be slid in the direction shown by an arrowhead 16 in sliding rails 15. In other words, photographing is carried out by scanning a light from the photographing lens 11 in the direction of the arrowhead 16. The line sensor 12 is preferably slid by using a pulse motor or

stepping motor (not shown in the figure). Also, this sliding is interlocked with the rotation of a linear condenser lens 33 of an illumination system 30 as will be mentioned later.

20 is a projection system and is fixed to the lower part of the photographing system 10. The photographing system 20 consists of photographing lens 21, object mirror 22, and focus adjusting knob 23. The projection lens 21 is interlocked with the projection lens 11 via a gear 24. In other words, if the projection lens 21 is moved in an optical axial direction by moving the focus adjusting knob 23, the photographing lens 11 is also moved in the same optical axial direction. Therefore, if the photographing lens 21 is focused, the photographing lens 11 is also simultaneously focused. In other words, these lenses are focused similarly to a two-eye reflex camera.

30 is an illumination system and is fixed to the rear part of the photographing system 10 and the projection system 20. The illumination system 30 consists of light source 31 constituted by halogen lamp, etc., light source mirror 32, and linear condenser lens 33. The linear condenser lens, as shown in Figure 3, is constituted by a so-called barrel type lens. The linear condenser lens 33 can move in the direction shown by an arrowhead 34 and can also rotate in the direction shown by an arrowhead 35 on the optical axis of the light reflected by the

light source mirror 32. The movement in the direction of the arrowhead 34 is easily carried out by manually moving the linear condenser lens 33. Also, the rotation in the direction of the arrowhead 35 is easily carried out by the pulse motor or stepping motor. The barrel type lens, as well known, can condense an incident light in an emission line shape. Therefore, when the linear condenser lens 33 exists at the position drawn with a solid line of the figure, the light reflected by the light source mirror 32 is condensed in an emission line shape, and the quantity of light on a Fresnel condenser mirror 40 has a shape as shown by 36. Similarly, the linear condenser lens 33 exists at the positions of 33_1 and 33_2 in the figure, the light reflected by the light source mirror 32 is condensed in an emission line shape at the positions of 36_1 and 36_2, respectively. In other words, with the rotation of the linear condenser lens 33, the emission line-shaped irradiation is moved in the direction of an arrowhead 38. Also, these emission line-shaped lights, as will be mentioned later, are used as lights for illuminating a screen during photographing, and this point is the maximum feature of the present invention. On the other words, when the linear condenser lens 33 moves in the direction of the arrowhead 34 and does not exist on the /3 optical path of the reflected light from the light source

mirror 32, the reflected light is uniformly irradiated as shown by 37 to the original image Fresnel condenser mirror 40. This light is used as a light source during projecting. Also, as the linear condenser lens 33, a barrel type lens whose surface is processed into Fresnel may also be used.

The Fresnel condenser mirror 40 is used in a convention overhead projector and installed in a rotatable way at 90° on the upper surface of a case 50.

In the case 50, printing system, control system, and power supply system are mainly housed. Figure 4 is a block diagram showing their constitutions. The printing system is mainly constituted by a thermal transfer type printer (used in facsimiles, etc.) having printing control circuit 60, roll 61, recording paper 62, paper feed motor 63, platen roller 64, thermal head 65, and roller 66. As the recording paper 62, both a plain paper and a transparent (light-transmitting) film are used. These recording papers are rolled on each roll 61.

The control system mainly has control circuit 70 for controlling each part, memory 71 for storing various information, motor driving circuit 72 for supplying an electric signal to motors 73 and 74 for driving the linear Fresnel lens 33 and the line sensor 12, and light-emitting element peripheral circuit 75 for processing the electric signal from the line

sensor 12. The power supply system consists of a power supply circuit 80 for converting an AC 100 V into a direct current and a battery 81. 90 is an operation part, and various information are input via a keyboard.

Also, the photographing system 10, projection system 20, and illumination system 30 are fixed in a rotatable way to a pole 100, and they can be housed in the case 50.

Next, the basic operation of the overhead projector/printer of the present invention consists of projection mode, photographing mode, mixed mode, reflex mode, and copy mode. Next, each mode is explained in detail.

(A) Projection mode

At the projection mode, an original image is placed on the Fresnel condenser mirror 40, and the original image is projected on a screen (not shown in the figure) with a whiteboard shape via the projection lens 21. The operation is the same as the operation of an ordinary overhead projector. However, at the projection mode, the linear condenser lens 33 of the illumination system 30 is not positioned on the optical axis of the light reflected by the light source mirror 32. The reason for this is that the Fresnel condenser mirror 40 is uniformly irradiated as explained in Figure 3.

(B) Photographing mode

First, the linear condenser lens 33 is placed on the above-mentioned optical axis, and the light being emitted from the linear condenser lens 33 is condensed in an emission line shape. In this state, the light from the screen incident via the photographing lens 11 is received by sliding the line sensor 12 as mentioned above. In other words, photographing is carried out in a shape in which the screen is scanned for each line. At that time, the light condensed in an emission line shape by the linear condenser lens 33 is reflected by the Fresnel condenser mirror 40 (no original image is not placed on it) and irradiated in an emission line shape to the screen being currently scanned by the photographing system. The emission line irradiation position on the screen is controlled by rotating the linear condenser lens 33 a mentioned above. Therefore, the movement of the line sensor 12 and the movement of the linear condenser lens 33 must be synchronized so that the above-mentioned operation can be carried out. This synchronization is easily carried out by a desired arithmetic in the control circuit 70 of Figure 4. The arithmetic result is given to the motor driving circuit 72 and converted into an electric signal for respectively driving the motors 73 and 74, and the line sensor 12 and the linear Fresnel lens 33 are controlled as mentioned above.

With the above photographing, the light received by the line sensor 12 is converted into an electric signal, converted into an electric signal being supplied to printing by the light-receiving element peripheral circuit 75, control circuit 70, and printing control circuit 60 and printed on the recording paper 62 via the thermal head 65.

Also, focusing during photographing is carried out by projecting a dummy image placed on the Fresnel condenser mirror 40 on the screen and adjusting the projection lens 21 via the focus adjusting knob 23 so that focusing may be realized on the screen As a result, the focus of the photographing lens 11 is/4 automatically fitted to the screen.

(C) Mixed mode

At the mixed mode, the original image on the Fresnel condenser mirror 40 is projected on the screen by the projection mode, and a desired original image is written in an overlapped write shape into the screen, switched to the photographing mode, and photographed. As a result, as the information being printed, the original image on the Fresnel condenser mirror 40 and the original image written in an overlapped shape on the screen are overlapped.

(D) Reflex mode

At the reflex mode, printing is carried out on a transparent film at the photographing mode or mixed mode. It is re-projected at the projection mode.

(E) Copy mode

At the copy mode, the original image written on a plain paper is placed on the Fresnel condenser mirror 40, and the optical axis of the photographing system is rotated in the direction shown by an arrowhead 110 of Figure 1 and vertically raised, and this original image is directly projected. At that time, it is not necessary for the illumination for photographing to be in an emission line shape since the distance between the photographing lens 21 and the original image is close.

Hereto, the present invention has explained based on one application example. Also, in the above-mentioned application example, in order to lighten the influence due to glittering on the screen, a polarization filter may also be inserted into the projection system and the photographing system. Also, since the optical axis of the overhead projector/printer is positioned below the screen and the distortion of an image is large thereby, each lens and mirror with an aspheric surface is used, or long-focus lenses are used as each lens, so that the distance from the screen is sufficiently adopted. Furthermore, with the

supply of an electric signal from the line sensor to an external computer, the display or printing is made possible on a display.

(Effects of the invention)

As explained above, according to the present invention, a new overhead projector in which photographing and printing functions are added to a conventional overhead projector can be provided. In particular, since the light source of the overhead projector can be effectively utilized in the illumination of an image on the screen during photographing, the device is small in scale and can be made portable.

4. Brief description of the figures

Figure 1 is a constitutional diagram showing an application example of the present invention. Figures 2(A) and (B) are detailed constitutional diagrams showing a photographing system. Figure 3 explains the operation of an illumination system. Figure 4 is a block diagram showing printing system, control system, and power supply system.

10 Photographing system

11 Photographing lens

12 Line sensor

20 Projection system

21 Projection lens

22 Object lens

23 Focus adjusting knob

24 Gear

30 Illumination system

31 Light source

32 Light source mirror

33 Linear condenser lens

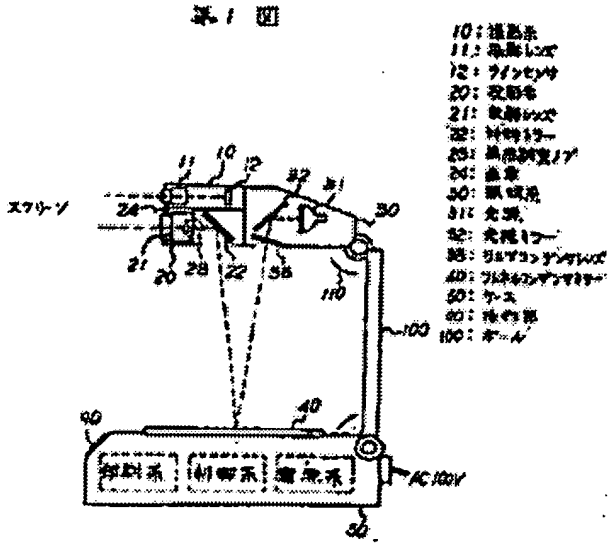
40 Fresnel condenser mirror

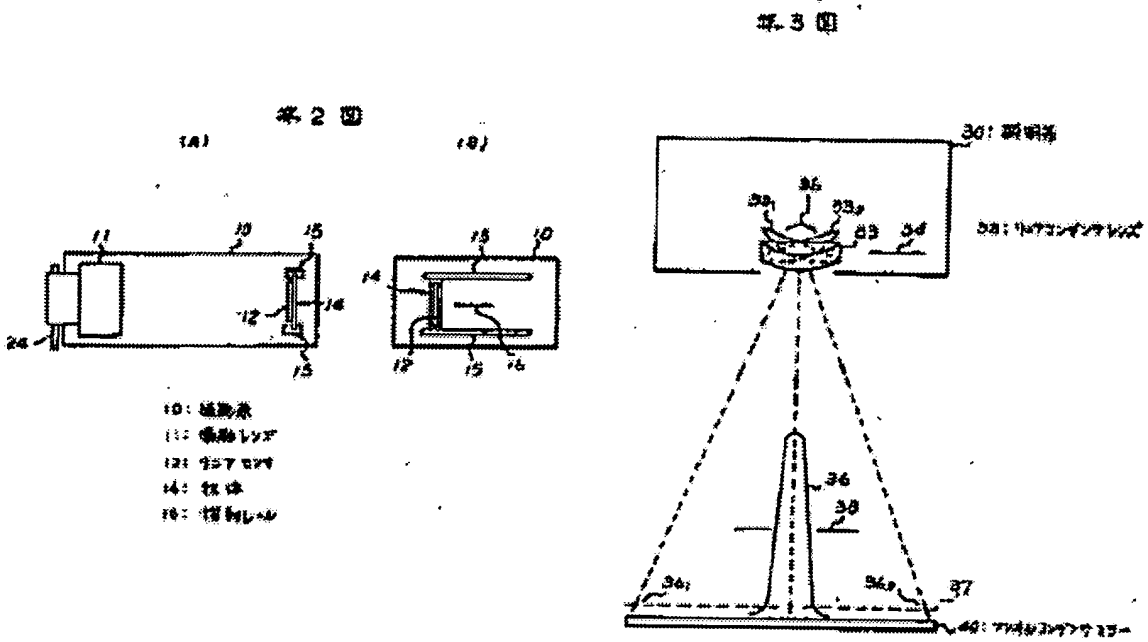
50 Case

90 Operation part

100 Pole

第 1 図





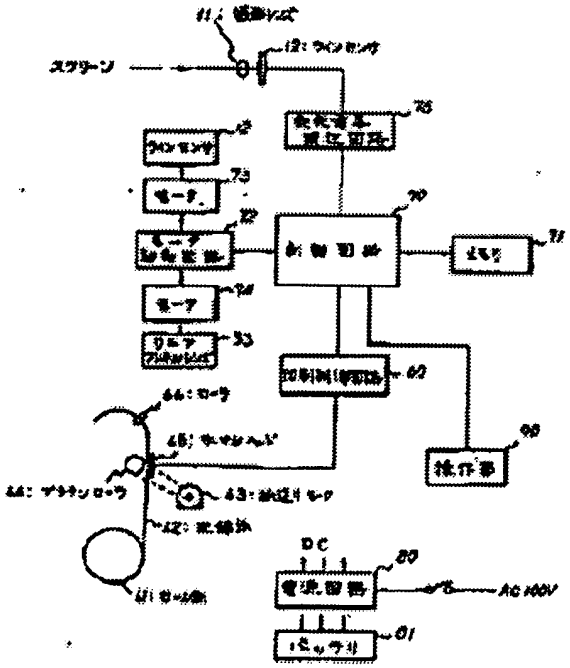


Figure 1:

10 Photographing system

11 Photographing lens

12 Line sensor

20 Projection system

21 Projection lens

22 Object lens

23 Focus adjusting knob

24 Gear

30 Illumination system

31 Light source

32 Light source mirror

33 Linear condenser lens

40 Fresnel condenser mirror

50 Case

90 Operation

100 Pole

A. Printing system

B. Control system

C. Power supply system

D. Screen

Figure 2:

10 Photographing system

11 Photographing lens

12 Line sensor

14 Carrier

15 Sliding rail

Figure 3:

30 Illumination system

33 Linear condenser lens

40 Fresnel condenser mirror

Figure 4:

11 Photographing lens

12 Line sensor

33 Linear Fresnel lens

60 Printing control circuit

61 Roll

62 Recording paper

63 Paper feed motor

64 Platen roller

66 Roller

70 Control circuit

71 Memory

72 Motor driving circuit

73 Motor

74 Motor

75 Light-receiving element peripheral circuit

80 Power supply circuit

81 Battery

90 Operation part

A. Screen